



PATENTS

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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In re Application of: : Group Art Unit: 1714
Paul J. GLATKOWSKI et al. :
App. No.: 09/894,879 : Examiner: Katarzyna I. Wyrozebski
Filed: June 29, 2001 :
Title: ELECTROMAGNETIC SHIELDING COMPOSITE COMPRISING NANOTUBES

Commissioner for Patents
United States Patent and Trademark Office
Washington, DC 20231

Sir:

Declaration under 37 C.F.R. §1.131

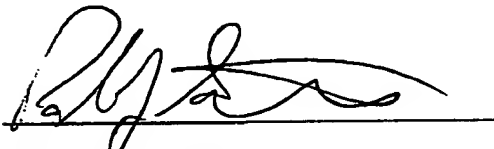
I, Paul J. Glatkowski, am an inventor of the invention disclosed and claimed in the above-referenced patent application.

I conceived and reduced to practice a composite having nanotubes with an aspect ratio which provides the composite with electromagnetic shielding prior to June 30, 1998, and therefore prior to the filing date of the provisional application from which U.S. Patent No. 6,426,134 claims priority, as evidenced by the documents attached hereto.

Under my direction, tests were performed on composites containing nanotubes to assess electromagnetic shielding. Briefly, 1.5 weight percent commercially available nanotubes were incorporated into composites and exposed to radiation at various frequencies and degrees of orientation. The results of are shown in the attached Test Report.

Data in the Test Report was normalized for a thickness of 1 mm and described in Table 2, which shows a shielding effectiveness of 182 dB at a loading level of only 1.5 wt%. Thus, the data shown in Table 2 reveals that the composites clearly offer both electromagnetic shielding and low observability.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the above identified application or any patent issued thereon.



Date: May 8, 2003

Paul J. Glatkowski

Attached: Test Report and Table 2.

TEST REPORT**SHIELDING EFFECTIVENESS TEST**

NO.	SAMPLE	Effective Thickness, millimeters	SHIELDING EFFECTIVENESS, dB, at Frequency									
			20 kHz		0.4 MHz		15 MHz		0.2 GHz		1.5 GHz	
			SE _{pw}	SE _m	SE _{pw}	SE _m	SE _{pw}	SE _m	SE _{pw}	SE _m	SE _{pw}	SE _m
1	9/1 SH	0.56	102	65	101	64	102	65	103	-	103	-
2	NEAT H	1.95	61	33	62	35	63	34	65	-	67	-
3	9/1 H	0.64	73	31	72	33	74	36	76	-	77	-
4	15% Carbon	3.12	106	85	105	86	106	87	108	-	108	-
5	9/1 N	2.23	102	63	102	64	103	65	104	-	105	-

COMMENTS

- The test per ASTM E4935, IEEE-STD-299-1991, MIL-STD-1037, MIL-STD-1044-12A, MIL-STD-461C and MIL-STD-462.
- Test conditions: T=22°C, RH=39%, P=101.7 kPa.
- Each magnitude of the plane wave (SE_{pw}) and magnetic (SE_m) shielding effectiveness in the table above is an average from six (six) runs of the test at a given frequency. The experimental error evaluated by the partial derivatives and least squares methods does not exceed 6%.
- The linear arrangement of the generator and receiver antennas and the samples under test meet the requirements of MIL-STD-108-12A and the UN Performance Test Plan CIRM-38FRT-993001 02-10-94.
- INSTRUMENTS AND DEVICES USED**
 - Generators: Model 650A HP (0.5 kHz to 110 MHz) and Model 8673 HP (50 MHz to 18 GHz)
 - Analyzers: Model 8592B HP and 8593E HP (both 9 kHz to 22 GHz)
 - Oscilloscope 10-4540 HK, Nanometer 3503 RU with Metrologic Laser M.0695/C MII
 - Antennas: HP11966C, HP11966E, HP11966F; Dipole Antenna Set HP11966H
 - Magnetic Field Pickup Coil HP11966K, Active Loop H-Field HP11966A
 - Dual Pre-amplifier KPS447F
 - Goniometer 3301-05 F-OM, Microster Homalwerke (10000 nm), Sterrett Dial Indicator 25-109 (1270 nm)
- The equipment listed above meets the applicable NIST, ASTM, OSHA and State requirements and was calibrated with the standards traceable to the NIST. The calibration was performed per ISO 9001 §4.11, ISO 9002 §4.10, ISO 9003 §4.6, ISO 9004 §13, MIL-STD-45662, MIL-I-45208, IEEE-STD-498, NAVAIR-17-35/MTL-1, and CSP-1/03-93.
- The equipment used in the test passed a periodic accuracy test in June 1997. The linear and angular measuring instruments were calibrated in December 1997. Next test - June 1998.

Table 2

Sample Loading and Shear	Thickness	Shielding Effectiveness Test, dB, at Frequency									
		20 kHz		0.4 MHz		15 MHz		0.2 GHz		1.5 GHz	
		SE _p	SE _m	SE _p	SE _m	SE _p	SE _m	SE _p	SE _m	SE _p	SE _m
		w		w		w		w		w	
Requirement		100		100		100		100		100	
1.5 wt% NT H	1 mm	182	116	180	114	182	116	184	-	184	-
1.5 wt% NT M	1 mm	114	48	113	52	116	56	119	-	120	-
1.5 wt% NT N	1 mm	46	28	46	29	46	29	47	-	47	-
Neat PET	1 mm	31	17	32	18	32	17	33	-	34	-

SE_{pw} = plane wave; SE_m = magnetic; H = high shear; M = medium shear; N = no to low Shear